CLAIMS

1. Method for checking the hermeticity of a closed cavity (14) of at least one micrometric component (1) which includes a structure (5, 6, 10) made on or in a portion of a substrate (2) and a cap (3) fixed onto a zone of the substrate to protect the structure, the cavity being delimited by the inner surface of the cap, the structure and the zone of the substrate, the method being characterized in that it includes steps of:

- placing the micrometric component (1) in a container (30), said component including inside the cavity (14) an indicator element (4) for checking hermeticity whose optical properties change permanently in the presence of a reactive fluid capable of reacting with the indicator element,

- hermetically sealing the container that contains said component,

- filling the container with a reactive fluid under pressure in order to subject said component to a higher fluid pressure to the pressure in the cavity for a determined time period, such as several days, the container including means (35 to 39) for introducing the reactive fluid, and

- checking the variation in the properties of the indicator element (4) by optical means as a function of the quantity of reactive fluid that has penetrated the cavity (14) and reacted with the indicator element to determine the hermeticity of said cavity.

2. Method for measuring the hermeticity of a closed cavity (14) of at least one micrometric component (1) which includes a structure (5, 6, 10) made on or in one portion of a substrate (2) and a cap (3) fixed onto a zone of the substrate to protect the structure, the cavity being delimited by the inner surface of the cap, the structure and the zone of the substrate, the method being characterized in that it includes steps of:

- placing the micrometric component (1) in a container (30), said component including, inside the cavity, an indicator element (15) for checking hermeticity whose electrical properties change permanently in the presence of a reactive fluid capable of reacting with the indicator element,

- hermetically sealing the container that contains said component,

- filling the container with a reactive fluid under pressure in order to subject said component to a higher fluid pressure to the pressure in the cavity for a determined time period, such as several days, the container including means (35 to 39) for introducing the reactive fluid, and

- electrically checking the variation in the properties of the indicator element as a function of the quantity of reactive fluid that has penetrated the cavity (14) and reacted with the indicator element to determine the hermeticity of said cavity.

3. Method according to any of the preceding claims, characterized in that several wafers (1') that each include several micrometric components (1) made on the same substrate (2) and having a plate (3') of caps (3) fixed to the substrate to enclose each structure of micrometric components, are placed in the container (30) to be placed under pressure by the reactive fluid introduced into the container for a determined time period.

4. Method according to claim 3, characterized in that the interior of the container (30) filled with reactive fluid is heated to a temperature higher than the ambient temperature, preferably to a temperature higher than 100°C by heating means (40, 41) during the determined time period.

5. Method according to claim 1, wherein the cavity (14) of the micrometric component (1) or each cavity of micrometric components made on the same substrate (2) of at least one wafer (1') and having a plate (3') of caps (3) fixed to the substrate to enclose each micrometric component structure, includes an inert gas, such as argon, at a pressure close to the atmospheric pressure, and wherein the indicator element (4) is a copper or titanium layer obtained by selective chemical etching or by selective deposition by evaporation under vacuum over one part of the inner surface of each cap (3) or over one part of each zone of the substrate (2), characterized in that the container (30) is filled with oxygen as the reactive fluid at a higher pressure than 10 bars, preferably substantially equal to 15 bars or 20 bars so that the optical properties of the copper or titanium layer are altered by oxidisation as a function of the quantity of oxygen that has penetrated the cavity during the determined time period.

6. Method according to claim 5, characterized in that after the determined time period and before the operation of checking the optical properties of the copper or titanium layer (4), the container (30) is depressurised and opened, in that the micrometric component (1) or at least one wafer (1') of micrometric components is removed from the container and placed on a moving support (51) of a measuring machine (50) for the hermeticity check, and in that for the hermeticity check, at least one light beam (IR) on a determined wavelength, which is emitted by a light source (20) of the measuring machine, is directed towards the copper or titanium layer, so as to be picked up by an image sensor (21) of the measuring machine by reflection of the light beam on the copper or titanium layer or by transmission of the light beam through the micrometric component passing through the copper or titanium layer, the

substrate and/or the cap being transparent to the light beam on the determined wavelength.

7. Method according to claim 6, wherein the structure of each micrometric component is a magnetic microcontactor (5, 6, 10) which includes a first conductive strip (6), one end of which is secured to the substrate by a conductive foot (5), and the other end of the first strip is free to move to come into contact with a second conductive strip (10) fixed to the substrate (2) in the presence of a magnetic field, an intermediate part of the first strip having an aperture (7) extending over most of its length, the distance separating the foot of the first strip and one end of the second strip corresponding to the length of the aperture, and wherein the copper or titanium layer (4), which is at a distance from and opposite the aperture (7), has a thickness comprised between 10 and 100 nm, preferably 30 nm, and a surface dimension less than the surface dimension of the aperture to define through the aperture first and second measuring zones, characterized in that, for checking the optical properties of the copper or titanium layer, a first light beam (IR) emitted by the light source (20) passes through the micrometric component (1) passing through the first measurement zone through the copper or titanium layer to be picked up by the image sensor (21) of the machine (50), in that a second light beam (IR2) emitted by the light source passes through the micrometric component passing through the second measurement zone without passing through the copper or titanium layer in order to be picked up by the image sensor, and in that processing means of the measuring machine determine a leakage rate of the micrometric component cavity by comparing the luminous intensity of the first and second beams picked up by the image sensor.

8. Method according to any of claims 6 and 7, wherein the substrate (2) and/or the cap (3) of each micrometric component (1) is made of silicon, characterized in that the first and second light beams (IR1, IR2) are emitted by the light source (20) with a wavelength of the order of 1.3 μm.

9. Method according to any of claims 6 and 7, wherein the substrate (2) and/or the cap (3) of each micrometric component (1) is made of glass, characterized in that the first and second light beams (IR1, IR2) are emitted by the light source (20) in the near infrared range, close to 850 nm.

10. Method according to claim 2, wherein the cavity (14) of the micrometric component (1) or each cavity of micrometric components made on the same substrate (2) of at least one wafer (1') and having a plate (3') of caps (3) fixed to the substrate to enclose each micrometric component structure, includes an inert gas, such as argon, at a pressure close to the atmospheric pressure, and wherein the indicator element (4) is a palladium resistor (15) made on one part of each zone of the substrate (2),

insulated conductive paths (16, 18) connecting the resistor and passing through the micrometric component for checking the electrical properties, characterized in that the container (30) is filled with hydrogen as the reactive fluid at a higher pressure than 10 bars, preferably substantially equal to 15 bars or 20 bars so that the value of the palladium resistor is altered as a function of the quantity of hydrogen that has penetrated the cavity during the determined time period.

11. Micrometric component (1) suitable for implementing the method according to any of the preceding claims, the component including a structure (5, 6, 10) made on or in one portion of a substrate (2) and a cap (3) fixed to one zone of the substrate to protect the structure, a closed cavity (14) being delimited by the inner surface of the cap, the structure and the zone of the substrate, characterized in that it includes, inside the cavity, an indicator element (4, 15) for checking hermeticity, whose optical or electrical properties change permanently in the presence of a reactive fluid capable of reacting with the indicator element in order to check the hermeticity of the cavity of said component.

12. Micrometric component (1) according to claim 11, characterized in that the cavity (14) includes an inert gas, such as argon, at a pressure close to the atmospheric pressure, and in that the indicator element (4) is a copper or titanium layer sensitive to oxygen as the reactive fluid, said layer being obtained by selective chemical etching or by selective deposition by evaporation under vacuum over one part of the inner surface of the cap (3) or over one part of the zone of the substrate (2).

13. Micrometric component (1) according to claim 12, characterized in that the thickness of the copper layer (4) is comprised between 10 and 100 nm, preferably equal to 30 nm.

14. Micrometric component (1) according to claim 13, characterized in that the structure is a magnetic microcontactor (5, 6, 10) which includes a first conductive strip (6), one end of which is secured to the substrate (2) by a conductive foot (5), and the other end of the first strip is free to move to come into contact with a second conductive strip (10) fixed to the substrate (2) in the presence of a magnetic field, an intermediate part of the first strip having an aperture (7) extending over most of its length, the distance separating the foot of the first strip and one end of the second strip corresponding to the length of the aperture, and in that the copper layer (4), which is at a distance from and opposite the aperture (7), has a surface dimension less than the surface dimension of the aperture to define, through the aperture, first and second measuring zones for the passage of light beams for checking hermeticity.

15. Micrometric component (1) according to claim 11, characterized in that the substrate (2) and/or the cap (3) are made of glass or silicon.

16. Micrometric component (1) according to claim 11, characterized in that the cavity (14) includes an inert gas, such as argon, at a pressure close to the atmospheric pressure, and in that the indicator element (15) is a palladium resistor made over one part of the zone of the substrate (2), insulated conductive paths connecting the resistor and passing through the micrometric component suitable for checking electrical properties.